

Triad Case Studies from the U.S. Army Corps of Engineers

**Brad Call, Sacramento District
Federal Remediation Technologies
Roundtable General Meeting,
Washington D.C. on December 1, 2003**

The Triad Approach

**Systematic
Project
Planning**



**Dynamic
Work
Strategies**

**Real-time Measurement
Technologies**

Overview

■ Projects:

- Kauffman Minter – wash out.
- Moody AFB – oil/water separator.
- McCormick and Baxter – wood treatment.
- Fort Lewis – disposal yard.
- East Palo Alto – agricultural pesticides.

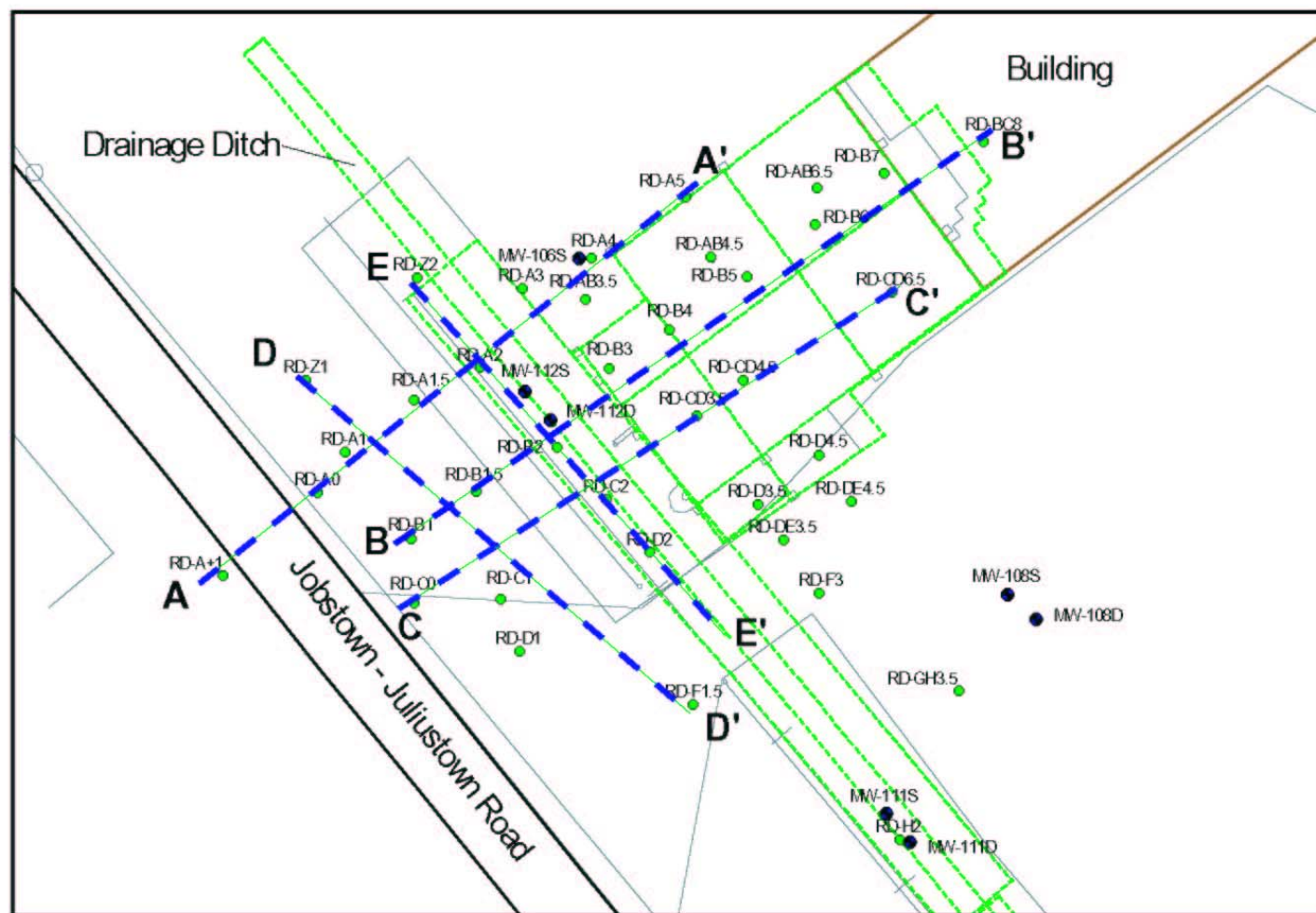
■ Summary

Kauffman Minter (KM) SF Site

- Industrial Transportation Facility.
 - Tanker wash out areas/Wastewater lagoons.
- OU1 ROD
 - Contaminated sediments removal.
 - Monitoring shallow GW.
 - High levels of TCE/DCE was discovered in subsurface soils and groundwater ...acting as a continuing source of contamination.
- OU2 ROD to resolve issues.

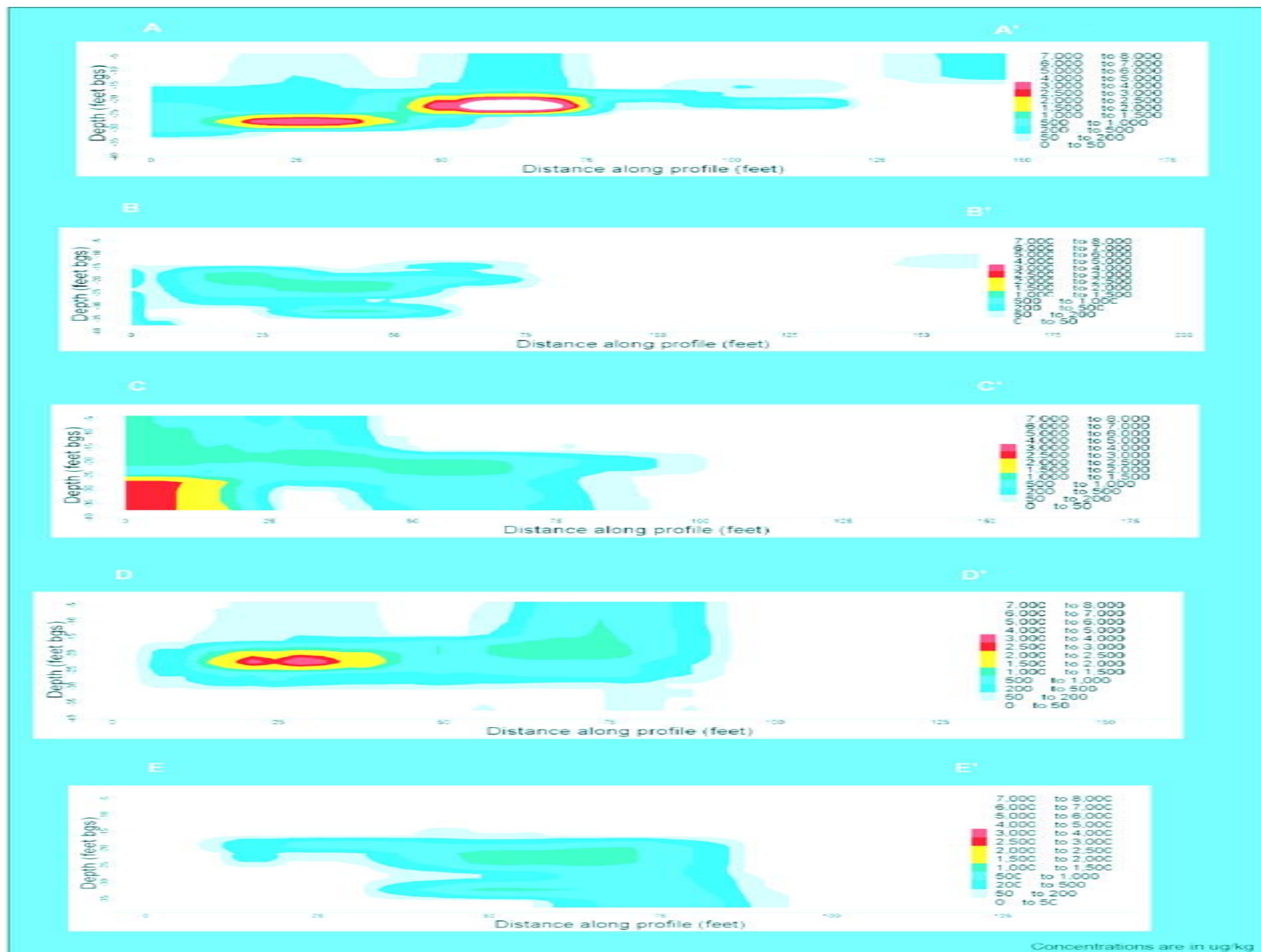
KM SF Site – OU2 ROD

- Established Insitu Chem-Oxidation for soils.
- Triad Approach used for Pre-Design Study:
 - **Systematic Planning** clarified goals: Remediate residual soils contaminated > 1000 ppb TCE or DCE.
 - **Refine CSM with FAM:** DPT sampling platform with Onsite GC/PID (mod. 8021B) provided high density of soil data for TCE and DCE.
 - **Dynamic Strategy:** Real-time VOC data used to direct further sampling and determine extent of contamination.
- Data from 170 soil samples confirmed 3 areas where soil remediation required.



A—A' Line of geochemical profile
presented in figures 3-4 and 3-5

Figure 3-3
Geochemical Profile Location Map
Kauffman and Minter Superfund Site,
Burlington County, New Jersey
CDM



Note: Profiles A-A', B-B' & C-C' trend SW-NE
 Profiles D-D' & E-E' trend NW-SE
 Refer to Figure 3-3 for profile location map

Figure 3-5
Trichloroethene Soil Concentration Profile
 Kauffman and Minter Superfund Site,
 Burlington County, New Jersey
CDM

Moody AFB – Bldg 758

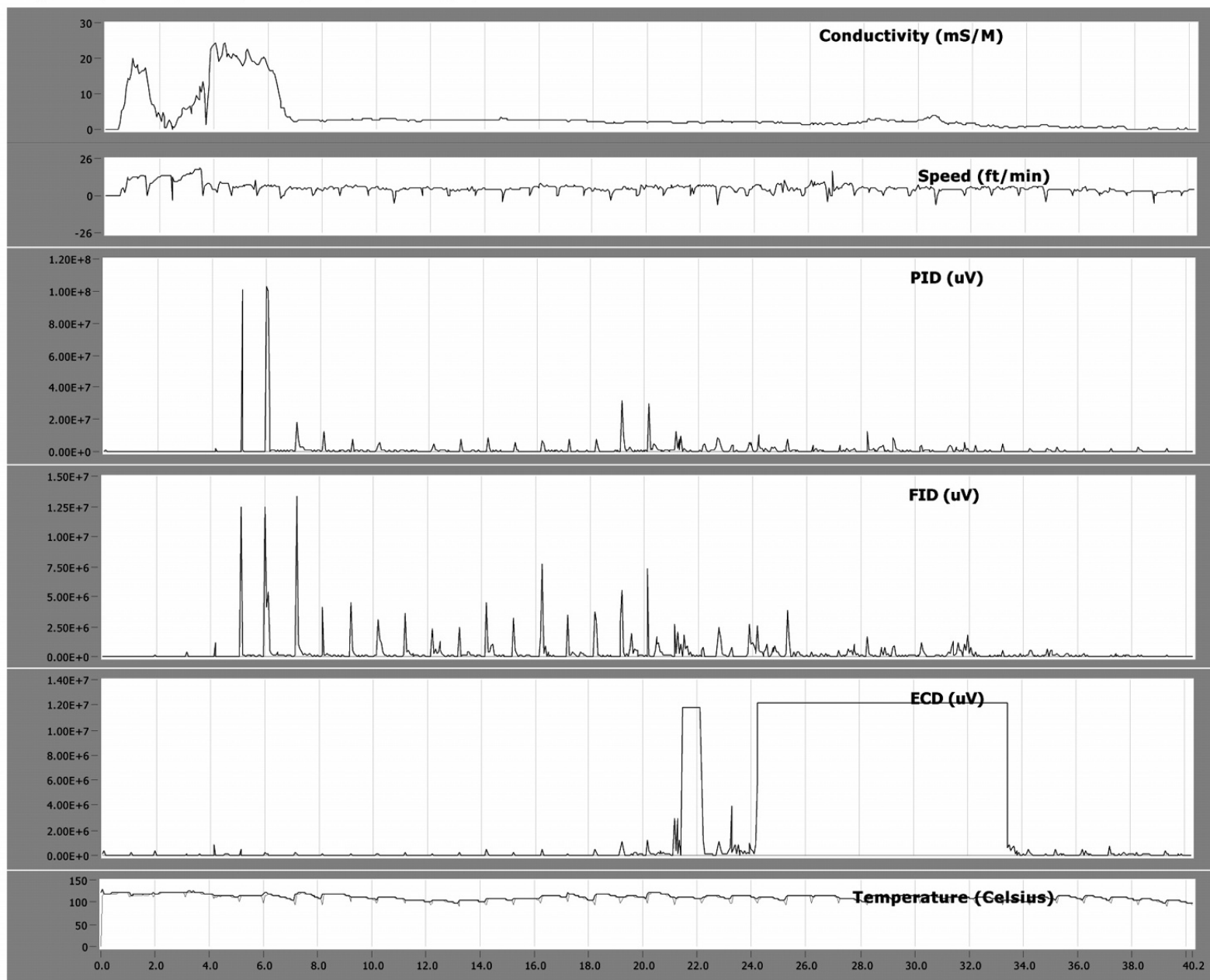
- Former Oil/Water Separator and Waste Oil Tank:
 - Wastes received from wash rack/jet repair areas.
 - Contaminants of Concern were fuel and solvents.
 - Removed in October 2000.
 - Post excavation sample showed detection of TCE at 3000 ppm in subsurface soils!
- Main source of uncertainty associated with the variability in soil stratigraphy and the impact this has on contaminant fate/transport.

Moody AFB – Bldg 758

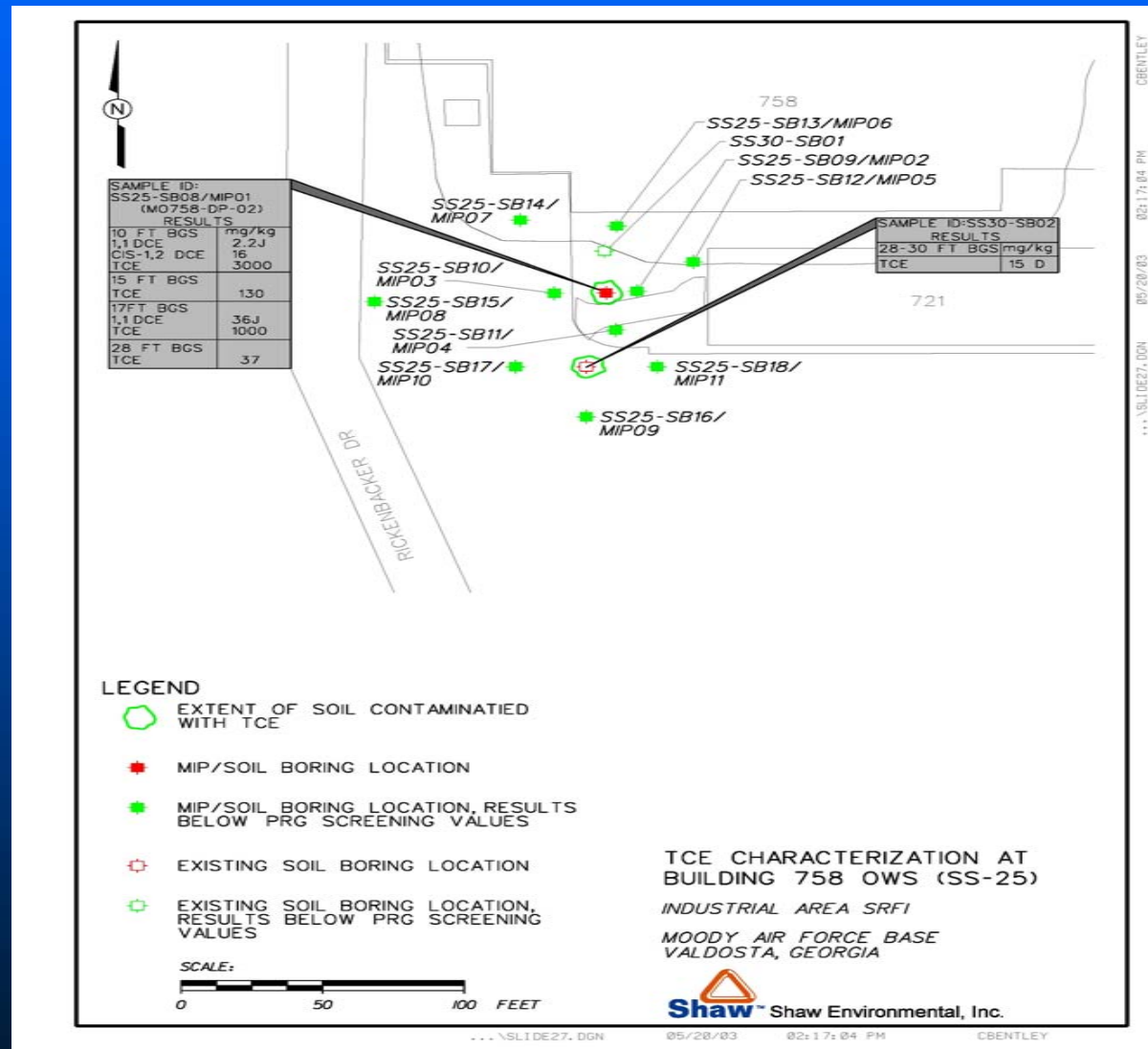
- Triad Approach used to evaluate extent of contamination and remediation options:
 - **Systematic Planning** established goals: **Remediating soil concentrations above Region IX Industrial PRGs.**
 - **Refine CSM with FAM:** DPT sampling platform configured with MIP (Membrane Interface Probe), an electrical conductivity detector, and 3 chemical detectors (PID, FID, ECD). Data sets **link the soil stratigraphy and presence/absence of contamination.**
 - **Dynamic Strategy:** Soil conductivity shows preferential F/T pathways, chemical data used to direct sampling for offsite analyses and determine contamination extent.
- Data from 8 MIP borings and sample data confirmed 2 areas where soils require remediation. ⁹



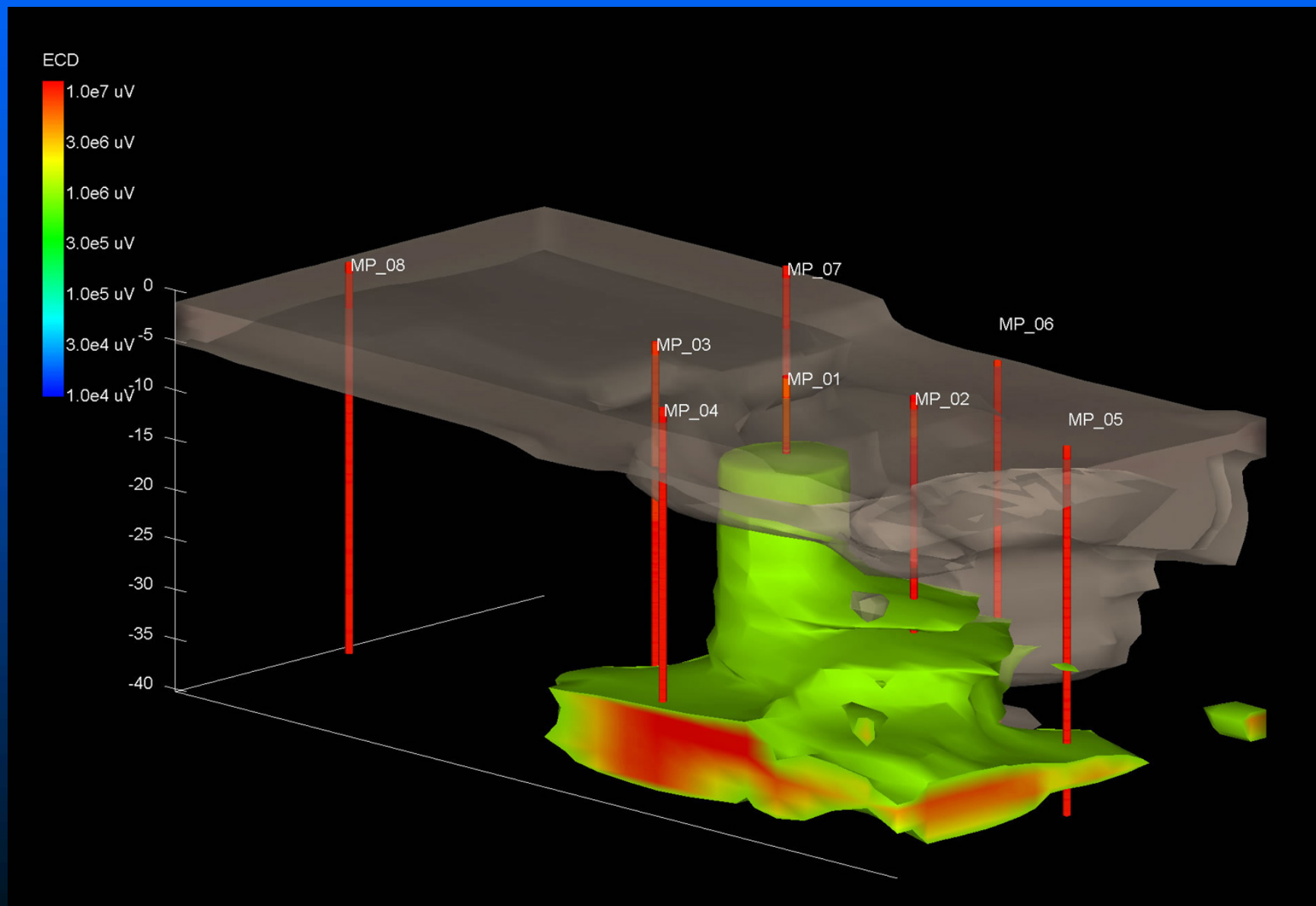
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Building 758 MIP Boring Location Map



Building 758 3-D MIP Data Visualization



McCormick and Baxter Superfund Site

- Operated as a Creosoting Company from 1942 – 1991
- Contaminants of Concern from the Preservatives (Creosote, PCP, Cu, Cr, As, Zn) and Solvent Carriers (kerosene, diesel, butane, ether)
- Nonaqueous Phase Liquid (NAPL) present acting as Source Material
- Main Source of Uncertainty associated with the Variability in Soil Stratigraphy and its impact on Source Material Distribution

McCormick and Baxter Superfund Site

- Triad Approach used to evaluate extent of contamination and remediation options.
 - **Systematic Planning** established goals:
 - » Determine the NAPL type (physical and chemical characteristics).
 - » Vertical/horizontal distribution of NAPLs.
 - » Determine soil stratigraphy (type, thickness, heterogeneity).
 - » Presence of manmade structures that may impact application of remedial technologies.

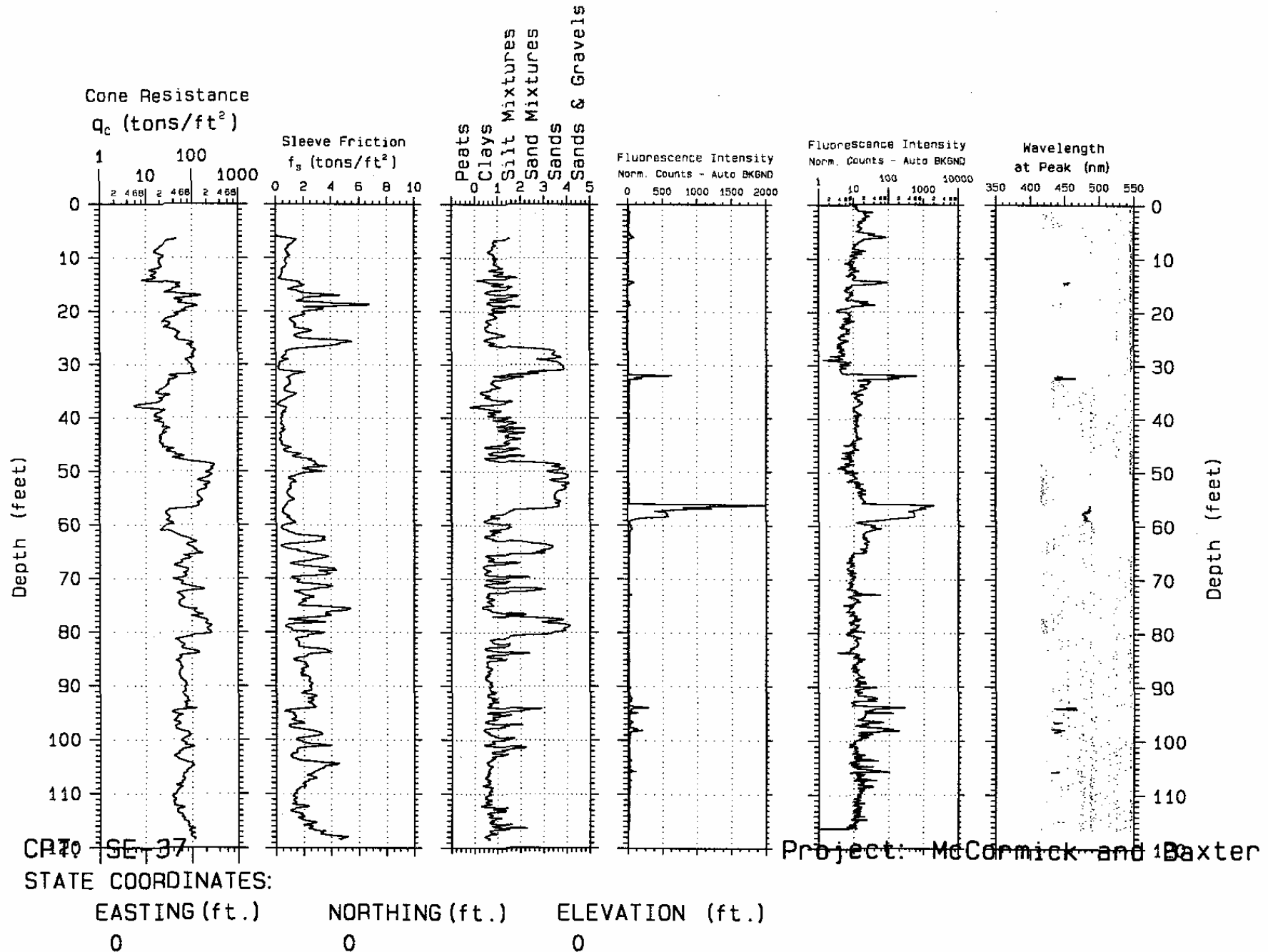
McCormick and Baxter Superfund Site

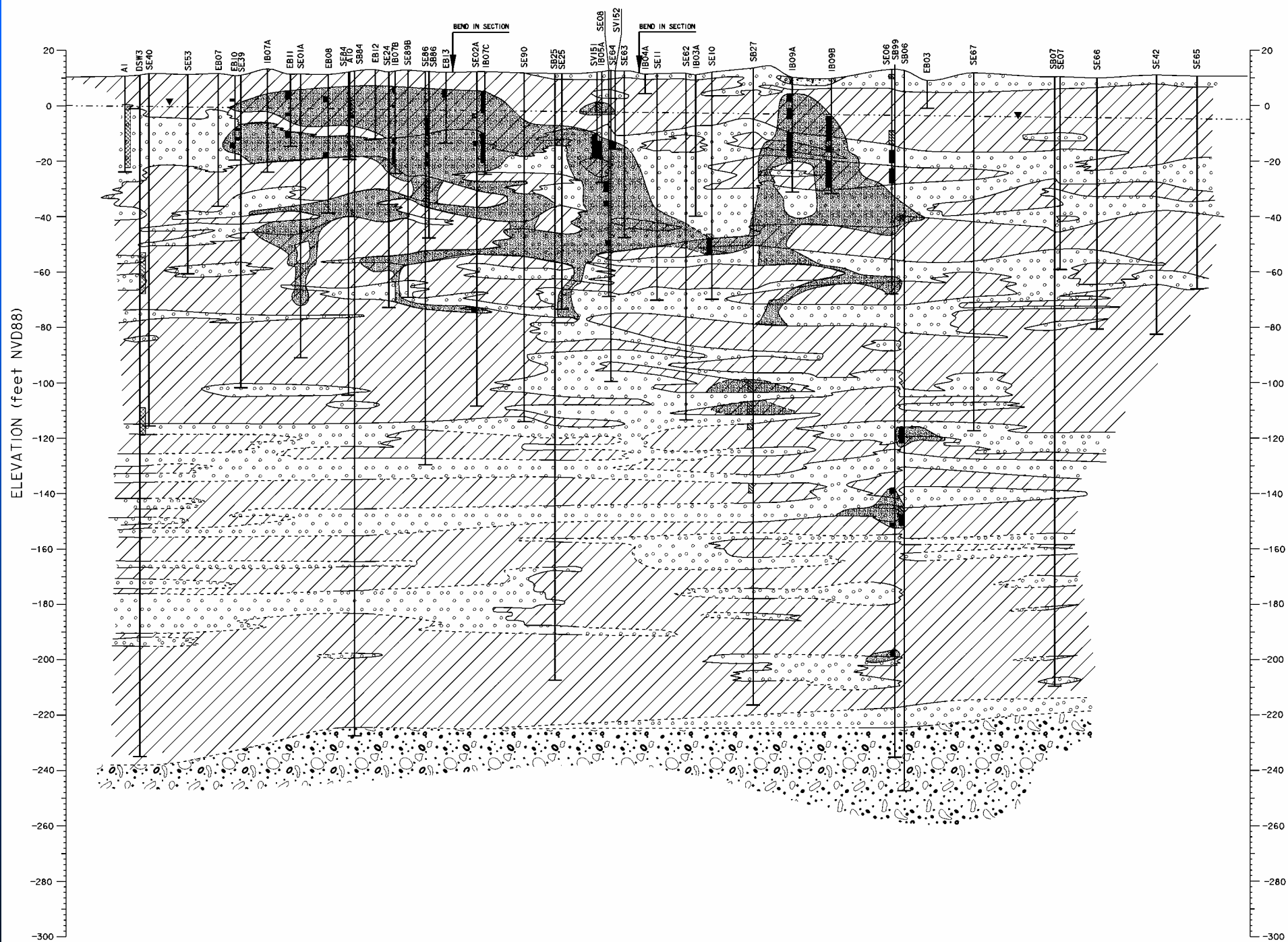
- Triad Approach continued:
 - Refine CSM with several FAMs:
 - » SCAPS Truck configured with a cone penetrometer tip and LIF (Laser Induced Fluorescence) sensor.
 - » Onsite IR TRPH Analyses.
 - » Field Laboratory analyzing:
 - PCP by GC/ECD.
 - TPH fingerprint by GC/FID.
 - » FLUTE ribbon sampler for NAPL detection.

McCormick and Baxter Superfund Site

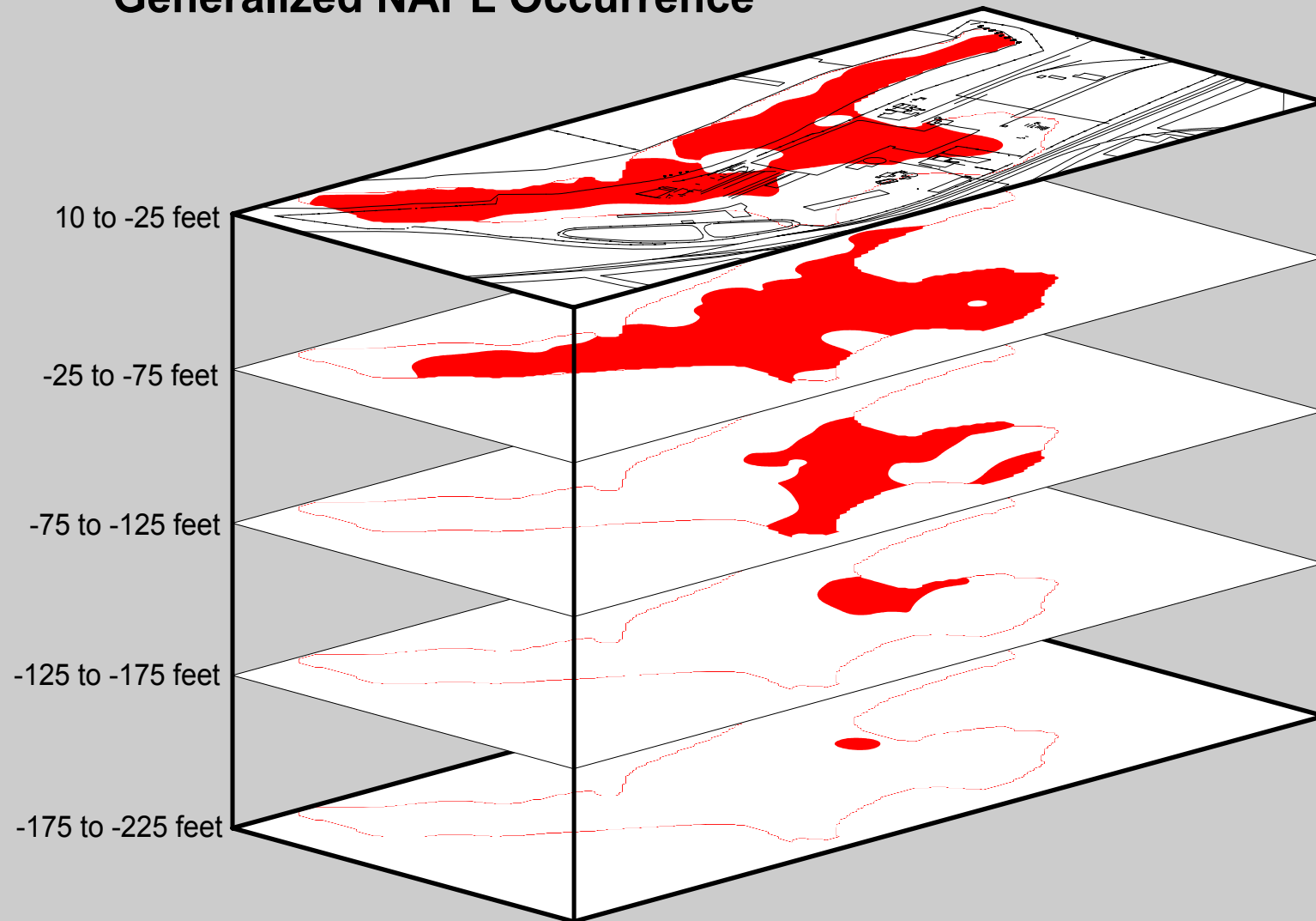
- Triad Approach continued:
 - **Dynamic Strategy:**
 - » **Cone penetrometer showed soil stratigraphy.**
 - » **Field observations / LIF data used to evaluate presence of NAPL / fuel PAHs, and directed sampling for definitive analyses (onsite TRPH, PCP, and TPH fingerprinting).**
 - » **Offsite samples taken for a broader chemical and physical characterization.**
 - **Communications: posting site information and data on a Internet-based transfer site.**

CPT based SOIL CLASSIFICATION





Generalized NAPL Occurrence



Ft. Lewis East Gate Disposal Yard

- Logistics Center mission was vehicle maintenance from 1946 to 1970s.
- Wastes received included spent fuels and solvents.
- Drummed wastes were noted as buried, or bulk liquids poured directly into trenches and subsequently burned and/or buried.

Ft. Lewis East Gate Disposal Yard

- Funding constraints mandated 2 phases.
- Triad approach used during both phases:
 - Phase I (1998-99):
 - » **Determine extent of contamination and Support data needs to complete an EECA.**
 - » **Buried Drums found mandated Interim Removal Action.**
 - Phase II (2000-2001):
 - » **Designed to collect support data for remedial action alternative chosen.**

Ft. Lewis East Gate Disposal Yard

- Triad approach used to evaluate extent of contamination and remediation options
 - **Systematic Planning established Phase I goals:**
 - » Determine the NAPL present and acting as a contaminant source (i.e., TCE) to GW.
 - » Estimate vertical/horizontal extent of NAPL.
 - » Determine soil stratigraphy (type, thickness, heterogeneity) and hydrogeology characteristics.

Ft. Lewis East Gate Disposal Yard

- **Phase I Triad approach continued:**
 - **Refine CSM with various techniques:**
 - » **Aerial photography.**
 - » **Geophysical methods (EM-61).**
 - » **Soil gas survey.**
 - » **Exploratory trenches.**
 - » **Direct push groundwater sampling.**
 - » **Onsite GC analysis.**

Ft. Lewis East Gate Disposal Yard

- Phase I Triad Approach continued:
 - Dynamic Strategy:
 - » **Aerial photos used to locate potential trenches/pits.**
 - » **EM survey clarified trenches containing metal debris.**
 - » **Soil gas sampling used to distinguish potential NAPL sources and direct locations for exploratory trenches.**
 - » **Exploratory trenches clarified the nature of the buried waste and debris.**
 - » **GW sampling were used to determine if NAPL was present and it's approximate extent.**
 - » **Real-time TCE data used to direct further sample locations and determine extent of contamination.**

Ft. Lewis EGDY-EECA

- Purpose: to evaluate remedial alternatives to accelerate cleanup and reduce overall costs.
- Preferred alternative:
 - Optimize P&T system.
 - Remove source area drums.
 - Thermal treatment of NAPL contaminated source soils and groundwater.

Results of Drum Removal (red) and Presence of NAPL (gray)



East Palo Alto

- Brownfields – 5 parcels (~1 acre).
- Former flower production – 1910 to 1950.
- Pesticides:
 - DDT
 - cyclodienes
- Residential redevelopment – restoration costs a critical factor.



East Palo Alto

- Triad Approach application:
 - Systematic Planning: CSM postulated application residue or mixing areas. PRGs/ESLs used for action levels.
 - Real-Time Measurement: Immunoassay paired with EPA 8081 for collaborative data set.
 - Dynamic Strategy: Soil samples collected initially from 3 depths at each location, field analysis guided vertical/horizontal delineation.

East Palo Alto

- Soil samples:
 - 78 locations, multiple depths
 - analyzed in the field
 - » Envirogard DDT
 - » RaPID Assay Cyclodiene
 - QC lab samples – good agreement
- Findings – CSM correct - no mixing areas but low levels of dieldrin and other pesticides – development can proceed with proper soil management.



Triad Case Studies Perspective

- Focus on Site Characterization/Source Identification.
- Small/simple site examples:
 - Helps find that “Needle in a haystack.”
 - Able to provide coverage necessary to assure regulators and public the CSM is accurate.
- Large/complex site examples:
 - Helps determine “How Much is there and Where.”
 - Support surgical removals / waste segregation.

Triad Case Studies Conclusion

- Proper Systematic Planning is the foundation to applying the Triad Approach correctly and receiving the most benefit.
- Triad application is independent of project size or complexity.
- Triad can ensure adequate data is available to support ongoing fieldwork, CSM development, and final project decisions while managing major sources of uncertainty.